AMENDMENTS TO THE CLAIMS

1. (Previously presented) A system for detection, interrogating a sample using a probe array configured to be responsive to a plurality of particles wherein the probe array generates one or more identifiable signals following interaction with the sample particles and wherein the sample composition is resolved, at least in part, by identifying the signals associated with each constituent probe of the array, the system comprising:

a platform that supports an array of samples;

a segmented detector configured to detect at least a portion of one or more identifiable signals associated with each sample wherein the position of each signal on a plurality of pixels forms an optical image;

a movement mechanism that provides a relative movement between the platform and the segmented detector wherein the relative movement provides a lateral movement of the optical image in sub-pixel sized steps; and

a processor configured to provide sub-pixel sized steps to yield a combined signal associated with a combination of images that results from the sub-pixel sized steps.

2. (Original) The system of Claim 1, wherein the movement mechanism comprises a movable stage coupled to the platform and wherein the movable stage is configured to move such that the image moves laterally with respect to an optical axis at the segmented detector and wherein the movable stage is capable of movements that cause the lateral movements of the image at a sub-pixel level.

3. (Original) The system of Claim 2, wherein the pixel of the segmented detector has a generally square active area and wherein two perpendicular sides of the square area are respectively generally parallel to X and Y axes of a two dimensional detector coordinate system and wherein the sub-pixel movements of the image comprises sub-pixel movements along the X and Y axes.

4. (Original) The system of Claim 3, wherein the magnitude of each sub-pixel movement along the X and Y axes is approximately an integer fraction of the side dimension of the square area.

5. (Original) The system of Claim 4, wherein each sub-pixel movement magnitude is approximately ½ of the side dimension of the square area.

6. (Original) The system of Claim 4, wherein each sub-pixel movement magnitude is approximately 1/3 of the side dimension of the square area.

7. (Previously presented) The system of Claim 1, wherein the platform comprises a bundle of fibers having their tips arranged generally in a planar manner wherein the tips of the fibers form a probe array that accommodates the array of samples and wherein the diameter of each fiber defines a feature size to be resolved by the segmented detector.

8. (Original) The system of Claim 7, wherein the segmented detector comprises a CCD having a plurality of pixels shaped generally as squares.

9. (Original) The system of Claim 8, wherein the pixel square is dimensioned such that the side of the pixel square is greater than approximately 1/3 of the diameter of the fiber.

10. (Original) The system of Claim 9, wherein the pixel square side is approximately 21 μm long and the fiber diameter is approximately 50 μm.

11. (Original) The system of Claim 1, wherein the sub-pixel sized shifts of the image relative to the segmented detector allows the processor to estimate what a sub-pixel sized element might output based on the combination of the associated pixels that overlap with the location of the sub-pixel sized element.

12. (Original) The system of Claim 11, wherein the sub-pixel sized element is dimensioned according to the magnitudes of the sub-pixel sized shifts.

13. (Original) The system of Claim 12, wherein the estimate of the sub-pixel element's output is expressed as $I = \frac{\sum_i d_i a_i w_i}{W}$, where $W = \sum_i a_i w_i$ and wherein d_i represents the pixel output at the i-th position, a_i represents the overlap fraction of the pixel at the i-th position with the sub-pixel element, and w_i represents a weight parameter associated with the i-th position of the pixel.

14. (Original) The system of Claim 13, wherein the weight parameter a_i associated with the i-th position of the pixel is user defined.

15. (Original) The system of Claim 14, wherein the weight parameter a_i is assigned a constant value of *1/N* where *N* is the number of pixel positions that overlap with the sub-pixel element.

16. (Previously presented) A method for improving the effective resolution of an image of an array of samples on a identifiable signals from the array of samples are captured by a plurality of pixels of a segmented detector so as to form the image of the array of samples, the method comprising:

inducing a plurality of relative motions between the image of the array of samples and the segmented detector;

capturing the identifiable signals from the array of samples at a plurality of relative positions between the array of samples and the segmented detector wherein the plurality of relative positions correspond to the plurality of relative motions; and

combining the captured identifiable signals associated with the plurality of relative positions so as to yield a combined image of the sample array that provides an improved information about the sample array so as to allow improved identification of at least one constituent component of the sample.

17. (Previously presented) The method of Claim 16, wherein inducing the plurality of relative motions comprises causing the analysis platform to move such that the image of the array of samples moves laterally with respect to the optical axis of the segmented detector.

18. (Original) The method of Claim 17, wherein the movement of the analysis platform causes the image to move by a step that is less than the dimension of the pixel of the segmented detector.

19. (Original) The method of Claim 18, wherein the image movement step is an integer fraction of the pixel dimension.

20. (Original) The method of Claim 19, wherein the pixel of the segmented detector has a generally square active area and wherein two perpendicular sides of the square area are respectively generally parallel to X and Y axes of a two dimensional detector coordinate system and wherein the image movement steps are along the X and Y axes.

21. (Original) The method of Claim 16, wherein combining the captured identifiable signals comprises combining outputs of pixels that overlap with a selected area on the segmented detector when the pixels are at the plurality of relative positions with respect to the image.

22. (Original) The method of Claim 21, wherein the selected area comprises an area that has sub-pixel dimensions.

23. (Original) The method of Claim 22, wherein an output that could result from the sub-pixel sized selected area is estimated as $I = \frac{\sum_i d_i a_i w_i}{W}$, where $W = \sum_i a_i w_i$ and wherein d_i represents the pixel output at the i-th position, a_i represents the overlap fraction of the pixel at the i-th position with the selected area, and w_i represents a weight parameter associated with the i-th position of the pixel.

24. (Original) The method of Claim 23, wherein the weight parameter a_i associated with the i-th position of the pixel is user defined.

25. (Original) The method of Claim 24, wherein the weight parameter a_i is assigned a constant value of *1/N* where *N* is the number of pixel positions that overlap with the selected area.

26. (Currently amended) A system for ~~detection~~ <u>signals from a probe array</u>, comprising:

a platform that supports <u>an</u> array of samples;

a segmented detector configured to detect at least a portion of ~~the~~ one or more identifiable signals associated with each sample wherein the position of each signal on a plurality of pixels forms an optical image;

a movement mechanism that provides a relative movement between the platform and the segmented detector so as to ~~cause~~ <u>result in</u> the optical image of the ~~sample~~ array <u>of samples</u> to move relative to the segmented detector by an amount having sub-pixel sized values; and

a processor configured to provide the sub-pixel sized relative movements to yield a combined signal associated with a combination of images that results from the sub-pixel sized relative movements.

27. (Previously presented) The system of Claim 26, wherein the relative movement between the platform and the segmented detector comprises a lateral movement of the optical image of the samples with respect to a normal of the segmented detector.

28. (Original) The system of Claim 27, wherein the movement mechanism comprises a movable stage coupled to the platform and wherein the movable stage is configured to move such that the image moves laterally with respect to an optical axis at the segmented detector and wherein the movable stage is capable of movements that cause the lateral movements of the image at a sub-pixel level.

29. (Original) The system of Claim 28, wherein the pixel of the segmented detector has a generally square active area and wherein two perpendicular sides of the square area are respectively generally parallel to X and Y axes of a two dimensional detector coordinate system and wherein the sub-pixel movements of the image comprises sub-pixel movements along the X and Y axes.

30. (Original) The system of Claim 29, wherein the magnitude of each sub-pixel movement along the X and Y axes is approximately an integer fraction of the side dimension of the square area.

31. (Original) The system of Claim 30, wherein each sub-pixel movement magnitude is approximately ½ of the side dimension of the square area.

32. (Original) The system of Claim 30, wherein each sub-pixel movement magnitude is approximately 1/3 of the side dimension of the square area.

33. (Previously presented) The system of Claim 26, wherein the platform comprises a bundle of fibers having their tips arranged generally in a planar manner wherein the tips of the fibers form ~~the~~ a probe array that accommodates the array of samples and wherein the diameter of each fiber defines a feature size to be resolved by the segmented detector.

34. (Original) The system of Claim 33, wherein the segmented detector comprises a CCD having a plurality of pixels shaped generally as squares.

35. (Original) The system of Claim 34, wherein the pixel square is dimensioned such that the side of the pixel square is greater than approximately 1/3 of the diameter of the fiber.

36. (Original) The system of Claim 35, wherein the pixel square side is approximately 21 μm long and the fiber diameter is approximately 50 μm.

37. (Original) The system of Claim 26, wherein the sub-pixel sized relative movement of the image relative to the segmented detector allows the processor to estimate what a sub-pixel sized element might output based on the combination of the associated pixels that overlap with the location of the sub-pixel sized element.

38. (Original) The system of Claim 37, wherein the sub-pixel sized element is dimensioned according to the magnitudes of the sub-pixel sized shifts.

39. (Original) The system of Claim 38, wherein the estimate of the sub-pixel element's output is expressed as $I = \frac{\sum_i d_i a_i w_i}{W}$, where $W = \sum_i a_i w_i$ and wherein d_i represents the pixel output at the i-th position, a_i represents the overlap fraction of the pixel at the i-th position with the sub-pixel element, and w_i represents a weight parameter associated with the i-th position of the pixel.

40. (Original) The system of Claim 39, wherein the weight parameter a_i associated with the i-th position of the pixel is user defined.

41. (Original) The system of Claim 40, wherein the weight parameter a_i is assigned a constant value of *1/N* where N is the number of pixel positions that overlap with the sub-pixel element.

42. (Previously presented) The system of Claim 1, wherein the array of samples is formed by using a probe array configured to be responsive to one or more selected types of particles from a sample wherein the probe array generates the one or more identifiable signals following interaction with the one or more selected types of particles thereby allowing determination of the composition of the sample in terms of the one or more selected types of particles.

43. (Previously presented) The system of Claim 42, wherein the combined signal generated by the processor provides an improved effective resolution of a probe position in the probe array.

44. (Previously presented) The system of Claim 43, wherein the effective resolution of the probe position provided by the combined signal is better than the dimension of the pixel.

45. (Previously presented) The method of Claim 16, wherein combining the captured identifiable signals provides an improved position information about a sample disposed on the array of samples.

46. (Previously presented) The method of Claim 45, wherein combining the captured identifiable signals provides an effective position resolution that is better than a dimension associated with the sample disposed on the array of samples.

47. (Previously presented) The system of Claim 26, wherein the array of samples is formed by using a probe array configured to be responsive to one or more selected types of particles from a sample wherein the probe array generates the one or more identifiable signals following interaction with the one or more selected types of particles thereby allowing determination of the composition of the sample in terms of the one or more selected types of particles.

48. (Previously presented) The system of Claim 47, wherein the combined signal generated by the processor provides an improved effective resolution of a probe position in the probe array.

49. (Previously presented) The system of Claim 48, wherein the effective resolution of the probe position provided by the combined signal is better than the dimension of the pixel.